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EXAMINER	
WONG, JOSEPH D	

ART UNIT	PAPER NUMBER
2169	

DATE MAILED: 11/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/648,791	DAMM ET AL.	
	Examiner	Art Unit	
	Joseph D. Wong	2169	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,8-10,14,15 and 18* is/are pending in the application.

4a) Of the above claim(s) *5-7,11-13,16-17 and 19* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,8-10,14,15 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *Sept 8, 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date [illegible]
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is issued in response to the amendment filed on September 8, 2006.

2. Claims 1-4, 8-10, 14-15, and 18 are amended.

3. Claims 1-4, 8-10, 14-15, and 18 are pending.

Drawings

Objections are removed for figures 2, 4, 6, and 10 under 37 CFR § 1.84 (a)(1) and § 1.84 (m) as the replacement drawings appear to be in compliance with requirements for black ink.

Objections are removed for figures 2, 4, 6, and 10 under 37 CFR § 1.84(p)(3) since the replacement drawings appear to be in compliance with shading requirements.

Objections are removed for figures 1(a-d), and 11(a-d) are as the replacement drawings appear to be compliance with the font size rules.

Objections are removed for figures 1-11 because the applicant includes descriptions as required by 37 CFR § 1.74.

Replacement figures 2, 3A, 3C and 4 remain objected to for having text not complying with 37 CFR § 1.84(p)(3) font height requirement or whose lettering is unclear.

Claim Objections

Claim objections to 1-4 are withdrawn for minor grammatical informalities.

Claim 18 is objected to because of the following informality: the claims are out of order. Dependent claims must immediately follow the claim from which they depend. See MPEP § 608.01(n). Appropriate correction is required.

Claim 18 is objected for a minor informality "An" for purposes of examination, the examiner will assume the applicant meant "A". This new objection was necessitated by amendment.

Claim 18 claims depends upon a "method of claim 8" but claim 8 has been amended to be a "computer-based system, a method" claim. The examiner is not aware of a present requirement for applicant to fit into only one statutory category.

Claim Rejections - 35 U.S.C. § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4 are rejected under 35 U.S.C. § 112 second paragraph because the amended phrase "tree-like data structure" is vague and indefinite. By definition, a tree is a hierarchical structure comprised of nodes, each node having exactly one parent (except for the root, which has none) and zero or more children (*Microsoft Computer Dictionary Fourth Edition*, Microsoft Press, 1999, p. 451). Applicant's specification does disclose a "tree-like" data structure, but the aforementioned claims do not disclose that specific structure. A relative term such as "tree-like" is held indefinite because a person having ordinary skill in view of the prior art and the status of the art would be unclear how data structures other than trees would satisfy the limitations of the claim. Even if the examiner gave patentable weight to applicant's intended use, a question

remains if "tree-like data structure" is vague enough as to unintentionally read upon analogous structures. A question arises if the claims can be interpreted to read upon structures not necessarily contemplated by applicant such as a gate-level schematic showing a hierarchy of gate arrays containing a range of integers between 0 and 1. Other interpretations may be inclusive of a traffic study of streets involving minimum and a maximum integer speeds or an exemplary multi-segment network divided into subnets with disjoint address ranges. It was a picture of one network topology that attracted the examiner's attention when searching for art during in an earlier office action. See MPEP § 2173.05(b)(F) or Ex parte Caldwell, 1906 C.D. 58 (Comm'r Pat. 1906).

Claim 9 is rejected under 35 U.S.C. §112 second paragraph because the phrase "augmented binary tree structure" is vague and indefinite. By definition, an augmented binary tree is a binary tree with increased functionality (*Introduction to Algorithms Second Edition*, The MIT Press, 2001, p. 308). Applicant's specification does disclose an "augmented" binary tree structure, but the aforementioned claims do not limit the augmentation to the augmentation disclosed in the specification. A person having ordinary skill in the art in view of the prior art and the status of the art would be unclear how tree structures other than binary tree structures satisfy the relative language of "augmented" binary tree structures, thereby rendering the scope of the claims indefinite. See MPEP § 2173.05(b).

Claim Rejections - 35 U.S.C. § 101

35 U.S.C. § 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-4, 14-15 and 18 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-4 are non-statutory under pre-emption as it claims every practical application of what purports to be a data structure while disclosing an intended use with "for use in". Disclosing a practical application with the "for" clause does not necessarily carry patentable weight—clarification is requested as to whether applicant intends a specific use while claiming every practical uses. Applicant has added elements with adding necessary relationships. A physical or logical relationship among nodes appears to be absent from the claim—disconnected nodes floating within a layer. While nodes are disclosed, a question arises as to whether applicant intended to claim essential interconnecting elements such as pointers, arcs, or linkages which seem necessary to show a minimal relationship between the nodes or between the layers. This new ground of rejection was necessitated by amendment. Applicant's amendment renders previous grounds of rejection under this statute moot.

Claim 14 is non-statutory because it does not produce a tangible result. The claimed process is the embodiment of an abstract idea that does not produce a useful, concrete and tangible result as required by judicial interpretation. Read in its broadest reasonable interpretation, the phrases "combining overlapping intervals" and "evaluating the overlapping intervals", as used in the claim, do not produce a tangible result. Mere combination or evaluation of intervals does not require the production of a tangible result. Finding the maximum disjoint interval is mathematically abstract and does not require a tangible result to be stored or displayed or used to produce some other tangible result. Also the system claim lacks

positive recitation of a physical article in the body of the claim. The preamble element does not necessarily carry patentable weight.

Claim 15 is non-statutory because it does not positively recite a computer readable medium and the need for the computer method to be on a computer readable medium and in executable form when executed on a computer. The limitations added by the claims do not add a computer readable medium to the multi-category system of a method of claim 14.

Claim 18 is non-statutory for adding disembodied nonfunctional descriptive matter to a computer readable media and omitting functional. Accordance with the method of claim 8 does not positively recite the execution of claim 8 upon a computer. Switching to a system claim may necessitate the presence of a physical article and also that the matter on a computer readable media be in executable form in order to avoid being nonfunctional descriptive matter. A computer in the body of the claim may be helpful in overcoming this ground of rejection. This new ground of rejection was necessitated by an amendment to the claim from which this depends as well as the amendment to this claim.

Applicant can look to MPEP 2106 (August 2006), Interim Guidelines, or contemporaneous case law with an applicable fact pattern for additional suggestions on how to overcome these rejections.

Claim Rejections - 35 U.S.C. § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 8 is rejected under 35 U.S.C. § 102(b) as being anticipated by Lakshman et al., (U.S. Patent No. 6,341,130), published 20 March 2003, hereinafter Lakshman.

As to claim 8, Lakshman teaches.

In a computer-based communication system, a method of providing a binary tree structure from a range specified rule set, each rule in the rule set having an equal number of fields and each field specifying a range having an upper and lower bound forming a set of intervals, the method / system comprising:

projecting end points of each interval of the set of intervals onto a line, the end points dividing the line into non-overlapping elementary intervals (column 4 lines 31-33, 'segments of a filter rule having one or more field ranges of destination addresses projected as horizontal intervals' and figure 4); and

forming the tree structure such that each node of the tree contains a single elementary interval (see Abstract, 'each entry associated with a particular filter-rule'), an indication of original intervals associated with the elementary interval (see Lakshman Abstract, 'the highest priority filter-rule overlapping each non-overlapping interval is associated with that interval'), and pointers to any adjacent nodes in the tree (by definition, tree nodes have pointers to their adjacent, a.k.a. child, nodes).

Claims 8, 10, 14, 15 and 18 are is rejected under 35 U.S.C. § 102(e) as being anticipated by Henderson et al., (U.S.Pre-Grant Pub. No. 2004/0133590), filed 8 August 2003, hereinafter Henderson. This ground of rejection is necessitated by applicant's amendment to the preamble.

As to claim 8, Henderson teaches:

In a computer-based (paragraph ¶3) communication (Fig. 17, item 1705) system, a method of providing a binary tree (Fig. 1a: "B-Tree" instance is interpreted to be binary with keys A, B or ¶8) structure from a range specified rule set (¶7, "thirty-two bit address, ...(IPv4)...identify over four billion different destinations"), each rule in the rule set having an equal number of fields (Fig. 4b: Rule A: 192.168.254.0/24) and each field specifying a range having an upper (Fig. 4b: 192.168.254.255) and lower (Fig. 4bd, 192.168.254.0) bound forming a set of intervals (Fig. 4b, items 414, 418, 422), the method comprising:

projecting end points of each interval of the set of intervals onto a line (Fig. 4b: see line left of Rule A), the end points dividing the line into non-overlapping elementary intervals (Fig. 4b: items 414, 418); and

forming the tree structure such that each node (Fig. 1a, Node 60) of the tree contains a single (¶57, "single key may be used to represent this fragment of A"[1]) elementary interval (Fig. 4b, item 414, wherein "192.168.254.0/24" in CIDR notation maps to an elementary interval), an indication of original intervals associated with the elementary interval (wherein Fig. 4b, item

[1] Absent evidence to the contrary, criticality, or unexpected results, the prior art's teaching of multiple intervals when supplemented with specific examples of a single key such as Classless Internet Domain Routing (CIDR) notation for 32-bit IPv4 addresses (inherently integers) would appear to anticipate an interval of integers.

425 specified an address range in CIDR notation corresponds with a species of elementary interval), and pointers (Fig. 4b, items 419 and 423) to any adjacent nodes in the tree.

As to claim 10 as applied claim 8, Henderson teaches:

The method wherein the binary tree structure (Fig. 17, item 1715) is an elementary interval (Fig. 1d) tree (Fig. 17, item 1715) for use in packet classification (¶171) in said computer-based communication system (¶3 and Fig. 17).

As to claim 14, Henderson teaches:

In a computer-based communication system (¶3 and Fig. 17), a method of providing a disjoint intervals (¶105, "non-overlapping range") tree (¶106) from a range specified rule set (¶102 or Fig. 7b, item 702), each rule in the rule set having an equal number of fields (Fig. 4a. items 416 mad 426) and each field specifying a range having an upper (item 702, "UB_key") and lower bound (item 702, "LB_key") forming a set of intervals, the method comprising:

combining (¶67, "fragmented") overlapping intervals (¶68 or ¶92) of the set of intervals to form larger intervals that are disjoint (Claim 34) to each other; and

finding the maximum (¶49, "maximum of N keys") disjoint intervals (¶174, "de-fragmentation")for the set of intervals.

As to claim 15 as applied 14, Henderson teaches:

The method comprising packet classification (¶171) in said computer-based communication system (¶3 and Fig. 17).

As to claim 18 as applied 8, Henderson teaches:

An binary tree structure (Fig. 17, item 1715) created in accordance with the method of claim 8 stored on a computer readable medium (¶176, "optical disk drive") for classifying packets (¶73, "classify...that packet").

Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Srinivasan et al., "Fast and Scalable Layer Four Switching", October 1998, ACM SIGCOMM Computer Communication Review, Proceedings of the ACM SIGCOMM'98 Conference on Applications, technologies, architectures, and protocols for computer communication SIGCOMM '98, hereinafter Srinivasan in view of Donald Knuth's Fundamental Algorithms, Vol. 1, 2nd edition, Addison-Wesley, 1973, p. 316-317, hereinafter Knuth.

As to claim 1, Srinivasan teaches:

A method of creating a tree-like data structure (see P. 193, Col. 2, Paragraph ¶2) for use in carrying out traffic flow (P. 191, Col. 2, 10th line from the bottom, "bandwidth for traffic" is a specific metric of traffic flow) evaluations (P. 202, Col. 2, Paragraph 3, "trace-driven

evaluation"; P. 191, Col. 2, Ln. 3, "622 Mbps"), the data structure having a range-specified rule set (P. 193, Col. 1, ¶4, "1024-1080...filter") where each rule in the rule set has a finite number (P. 193, Col. 1, Ln. 3)of rules and has multiple fields specified by ranges (P. 193, Col. 1, ¶4), where a range is an integer interval with a lower bound (P. 193, Col. 1, ¶4, "1024")and an upper bound (e.g. "1100"), there being the same number of layers (Fig. 8[2] or title "Layer Four" and Fig. 4 with 4 layers visible)in the tree-like data structure (could be interpreted to be any connected structure) as there are fields in each rule (see Fig. 8), where each layer is comprised of nodes (P. 194, Col. 1, last paragraph), each of said nodes having an associated rule set selected from the range-specified rule set(P. 193, Col. 2, ¶1, "rules...address ranges"), the method comprising:

forming a first layer of the tree-like data structure made up of a set of non-overlapping (P. 201, Col. 1, "no overlap") integer intervals (P. 198, Col. 1, ¶4, "IP addresses" which are integers with specific bit-lengths inherent to IPv4 and IPv6); and

forming one or more additional layers each additional layer being made up of a set of non-overlapping integer intervals and a set of overlapping integer intervals (P. 200, Col. 1,¶4) to provide said tree-like data structure;

wherein (not necessarily given patentable weight) the traffic flow evaluations can be carried out by one pass (P. 195, Col. 2, ¶2, O(W) which is logarithmic[3]--Thus Srinivasan is silent about one pass) through the data structure.

As to claim 2 as applied claim 1, Srinivasan teaches:

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[2] Where a layer can also be interpreted to be a separate hash table.
[3] It would have been obvious to one of ordinary skill in the art to visit unvisited nonessential nodes after logarithmic completion within the tree to meet applicant's limitation of a single pass.

The method wherein the tree-like data structure is a disjoint graph with the non-overlapping integer intervals (P. 197, Col. 1, 3rd ¶ from the bottom, "IP address" is inherently a specific bit length integer) representing elementary intervals and the overlapping integer intervals representing disjoint intervals (P. 201, Col. 1, Ln.2), wherein disjoint intervals are intervals formed from overlapping (P. 200, Col. 1, ¶4) integer intervals by combining them to form integer intervals that are disjoint (inherent to set pruning P. 194, Col. 2, Sec. 5.1) from each other.

As to claim 3 as applied claim 2, Srinivasan teaches:

The method wherein the range specified rule evaluations are incorporated in packet classification (P. 201, Col. 2, ¶4, "QoS Routing" is a specific type of packet classifying according to Quality of Service) in a communications system (P. 191, Col. 2, "internet core").

As to claim 4 as applied claim 1, Srinivasan teaches::

A tree-like data structure (P. 208, Ln. 1, "grid of tries") created in accordance with the method of claim 1 stored on a computer readable medium (Srinivasan is silent as to the medium but recites "stored" on P. 196, Col. 1, 2nd to last ¶) for classifying packets(P. 201, Col. 2, ¶4, "QoS Routing" is a specific type of packet classifying according to Quality of Service).

While Srinivasan fails to explicitly teach "one-pass" and "computer readable media", Knuth teaches them. Knuth does explicitly teach the limitation of a single pass in the first volume of his Fundamental Algorithms, p. 316, second paragraph, "examining the nodes of the tree systematically so that each node is visited exactly once". Knuth displays a comparable problem on P. 330, #4, difficulty level of "[20]". Knuth teaches storing "input-output operators" on "tape" or "disk" on P. 136, Ln. 11-15.

Srinivasan and Knuth are analogous art for the same field of endeavor of modifying trees for new applications. Indeed Srinivasan is a telecommunications specific conference paper whose abstract admits to modifying a computational geometry solution for use in telecommunications while Knuth is used in undergraduate computer science curriculums. At the time of the invention it would have been obvious to a person of ordinary skill in the art of designing a data structure to combine the specific tree of Srinivasan with the explicit single pass teaching and tape or disk computer readable medium of Knuth's college textbook. A skilled artisan would be motivated by the "overwhelming tendency to prefer constructions that are simplest" (P. ix, ¶1). In deed Knuth tells college students on P. xv, 2nd to the last line, for a difficulty rating of 20, "An average problem that tests basic understanding...you may need fifteen or twenty minutes to answer it completely".

Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable by Henderson et al. US PG Pub 2004/0133590A1 (hereinafter Henderson) further in view of Hanson et al., "The Interval Skip List: A Data Structure for Finding All Intervals That Overlap a Point", 16 June 1992, University of Florida, UF-CIS-92-016, hereinafter Hanson.

As to claim 9 as applied claim 8, Henderson teaches:

The method wherein the augmented binary tree structure (interpreted to include a B-Tree instance, Fig. 16, item 1609 or Fig. 17, item 1715 or ¶5) is used for stabbing queries (Henderson is silent with respect "stabbing queries").

However, Hanson teaches a stabbing query (abstract) is possible with O(n) storage when the intervals do not overlap on (see Hanson P. 15, last paragraph). Henderson and Hanson are

analogous art propose solutions to the same math problem of interval checking[4]. At the time of invention, it would have been obvious to a person having ordinary skill in the art to augment the teachings of Henderson with Hanson to support stabbing queries. The motivation to combine which arises from the desire to "quickly determine which of a collection of intervals overlap a point" recited in Hanson's abstract.

Response to Amendment

Applicants' arguments have been carefully and respectfully considered, and some are persuasive, while others are not. Accordingly, objections and rejections have been removed where arguments were persuasive, but rejections have been maintained where arguments were not persuasive. Also, new rejections based on the newly added claims have been set forth. Accordingly, claims 1-4; 8-10, 14-15, and 18 are rejected, and this action has been made FINAL, as necessitated by amendment.

Response to Arguments

The specification has been amended to overcome the objections to paragraphs ¶2, 4, 5

The drawings have been amended to respond to the objections noted earlier except figures 2, 3A, 3C and 4 whose font heights of subscripts remain smaller than the 1/8 inch requirement or are illegible. Objections on other grounds have been corrected.

With respect to applicant's argument that the claims 1-4 have been amended to avoid the 35 U.SC. 112 claim rejections, the examiner respectfully arrives at a different conclusion. With respect to applicant's amended language of "finite", the examiner cannot know if this is sufficient to limit the tree-like structure to a finite one. The term "finite" is not used in

[4] Henderson intends to use the solution for traffic classification and Hanson for computational geometry and general pattern matching. These teachings are still good for all that they teach.

conjunction with a positively recited upper bound so it would appear to be only as definite as the upper bound which did not appear to be defined. If it would take a person having ordinary skill in the art between a month and a year to implement the scope of data structures claimed by applicant, a Wands factor question may arise of how much disclosure and experimentation would be needed for applicant to claim mathematical proportions and properties of a data structure instead of a range of structures and algorithm when the claimed range appears disproportionate relative to applicant's disclosure. For purposes of examination, the claim limitation "tree-like data structure" can be vaguely interpreted to be any data structure even nodes without arcs or any proportioned structure or cycles can be added within the language of "comprising" and "tree-like". Pointers and arcs essential to the operation of the data structure appear to be absent but nodes are seen within the claim. A person of ordinary skill in the art may need to quickly figure out how the nodes are connected in order to make or use the claimed invention.

The examiner acknowledges that applicant's narrowing of claims 1-4 overcome and render moot and rejection based on Herbert. The examiner acknowledges that Herbert is not applicant's intended invention. Applicant's narrower interpretation of claims did not justify the use of Herbert. Herbert by its topology diagrams or filtering language appeared to be within the examiner's initial interpretation of applicant's claims 1-4. The examiner replaces Herbert as the amended claims render Herbert moot.

On page 13 of applicant's remarks, third paragraph, "database techniques using hashing, prefix-based solutions, or the best known state of the art FIS" are acknowledged. Applicant's statement in the next paragraph, Applicant's statement, "Unlike FIS which requires multiple traversals to find the matching rule, which is why it is faster." may presume prior art without the

combination of FIS used with other search optimizations such as hashing, sorting, or pruning. The update search does not support this presumption. The amended claim language did not appear to structurally preclude using a hashed or sorted variation of FIS.

While the examiner acknowledges there is contrasted language in paragraphs ¶66-67 of Henderson with applicant's claims, the examiner believes that Henderson provides specific examples and synonyms which can be used to respond to the applicant's concerns which the examiner has taken under advisement. While applicant is correct that Henderson does not explicitly recite the same word of "disjoint", applicant overlooks Henderson's synonymous recitation "one example of non-overlapping ranges" in ¶58 meets the examiner's interpretation of applicant's term "disjoint".

The examiner appreciates that Lakshman teaches the use of a "prefix length" while applicant claim does not. Applicant's "comprising" claim language which the examiner interprets to mean "at least one elementary interval" instead of a narrow interpretation of "single elementary interval". Within the second line of applicant's quotation of Lakshman on page 14 of applicant's remarks, "non-overlapping intervals" or lines 6-7 of the quotation (same page), "prefix length and non-overlapping interval" meets the "comprising" construction surrounding "single elementary interval".

The examiner asserts that a rejection based on Henderson was necessitated by applicant's amendment to the preamble.

The examiner acknowledges the applicant's argument that the term "disjoint" is not explicitly recited anywhere within Henderson. The examiner's respectfully submits that the definition of "disjoint" is interpreted to mean "having no elements in common" which appears to

match Henderson's use of the phrase of "non-overlapping" within the context of a range elements. The examiner's interpretation of disjoint based on Oxford English Dictionary's definition under (ppl) is "separate" or "having no elements in common".

Applicant's arguments against the arts of Henderson and Knuth are rendered moot by the examiner's change to Srinivasan as the examiner believes the change is necessitated by applicant's amendment.

Some differences were noticed between what the examiner found in the prior art of record and the instant specification or drawings. While the shared EIT and DIT's shown in figures 3 and 4 respectively may be analogous with set-pruning or other attempts to compress redundancy, the discernment of a shared decision outcome "D" as seen in figure 12(e) as it pertains to network packet classification comprising (IP source address, IP destination address, TCP protocol, source port, destination port, rest of the header, and payload) in paragraph ¶3. The examiner observes that the applicant recites that the limitation that the best matching rule for a packet is the matching rule closest to the top at the bottom of ¶3 while the prior art of Henderson appears to recite the tightest match at the bottom. The applicant appears to define best match as the lowest rule number. Henderson specifically recited a range of 32-bit IPv4 addresses (inherently integers) using Classless Internet Domain Routing (CIDR) notation. There may be other combinations of ranges of numbers (e.g. "IP source address, IP destination address" and/or "TCP protocol, source port, destination port", ¶3) or other narrowing language that may be helpful in overcoming this single reference. Just because the examiner did not apply prior art specific to non-network traffic flow evaluation such as computational geometry for range checking algorithms does not mean those arts should not be interpreted to mean that range-

checking algorithms within those domains would not be usable for network packet classification. Prior art recited a previous use of "computational geometry" possibly collision detection. Cloudshield appears to sell a programmable hardware firewall device that capable of removing packets according to predetermined rule criteria or marking the packet for closer examination by another device. The examiner did not see within the prior art of record, Cloudshield-like functionality with devices meeting applicant's limitation applied to an "IP router" and specifically an "edge router device" in the specification ¶152 in concert with VPN, firewall, IPsec, and QoS ¶5 functionality combined with the dynamic insertion capability of PR-Trees ¶149 in conjunction with shared sub-EITs and shared DITs which appear to be more specific compression over the recitation of "set-pruning". Applicant's disclosure ¶21 suggests a field of search in art areas that may be more crowded or mature such as "computer graphics, large knowledge-based systems, and some computational geometric problems". Although applicant's disclosure appears to favor a software algorithm, the claims express an intended use for traffic flow evaluation but did not appear to rule out the possibility of hardware gate array optimization, optimized expressions of logic gates with binary values, or modified TCAMs. Applicant's disclosure would appear to differ in that it teaches a flexible multi-dimensional capability even the claimed invention could be used on low –dimensional (5 or lower) or single dimension rule checking. Applicant's disclosure may also be able to express more concisely range checking of ranges that consist of values that do not express compactly in prefix form such as a prime number pair like a range between 7 and 15 which appear to incur no savings from prefix expression. The examiner did not interpret the claimed invention to necessarily preclude prefix notations. The general thrust seen in Xu appears to be indexed hash tables pointing into a tree

structure. Applicant appears to make up for the lack of hashing with disclosure of compression steps and sorting. Applicant's disclosure appears to differ from the cited art in that it supports multiple levels of tree-compression for intervals and groupings of intervals as well as sorting which may have certain space and insertion advantages. The examiner noticed that the NPL prior art of record mentions "VPN" in Srinivasan, P. 141, Section 8 and Feldman, P. 1193, first and second paragraph. The examiner did not see these limitations positively recited together within the prior art of record and cannot know if they would be found during an expanded update search of areas more mature than network packet classification.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

If applicant still believes there is patentable subject matter within the disclosure and has reasons why those differences define over the prior art, then applicant can look to MPEP § 324

IV (August 2006) and 37 CFR 1.114 for additional suggestions that may be helpful for overcoming the finality of this office action.

Other Art on Record

Additional prior art of is made of record, listed on form PTO-892, in addition to what examiner relied upon is considered pertinent to applicant's disclosure.

The following literature is mentioned as pertinent but not applied:

Freund et al., US Pre-Grant Pub. No. 2003/0055962A1, Filed 30 August 2001, is pertinent because it discloses an invention whose functionality has some similarities but whose structure differs from the instant specification.

Su, Ching-Fong, "High-Speed Packet Classification Using Segment Tree", 27 Nov. 2000, GLOBECOM '00, IEEE Press. P. 582-586, appears pertinent because it summarizes the space and time requirements of Srinivasan and Lakshman. It also draws on the use of computational geometric techniques to solve packet classification problems.

Böhm et al., "Searching in High-Dimensional Spaces—Index Structures for Improving the Performance of Multimedia Databases", September 2001, ACM Computing Surveys, Vol. 33, No. 3, P. 322-373.

Feldman et al., "Tradeoffs for Packet Classification", March 2000, IEEE Infocom, IEEE Press, P. 1193-1202.

Srinivasan et al., "Packet Classification using Tuple Space Search", August 1999, ACM SIGCOMM' 98, P. 135-146, appears pertinent because it discloses a logarithmic algorithm which would appear to run faster than a single pass.

Taylor, "Survey and Taxonomy of Packet Classification Techniques", September 2005, ACM Computing Surveys, P. 238-275, is deemed pertinent because it summarizes state of the art packet classification techniques. This was not applied because its date is too recent but provides a high-level contextual framework for evaluating the arts seeking to solve the same problem.

Xu et al, "A Novel Hash-based Packet Classification Algorithm", 09 Dec. 2005, 2005 Fifth International Conference on Information, Communication, and Signal Processing, IEEE Press, is pertinent because it teaches a hash augmentation to accelerate searching a tree structure. This art was not applied because it was published after the date of invention.

Cloudshield is mentioned but not cited art that appears pertinent because it allegedly includes embedded software and FPGA hardware for performing real-time wire speed packet filtering. This was not applied as its documentation was not in front of the examiner when this office action was written.

The examiner has not cited but is aware of packet filtering functions in certain models of Juniper and Cisco core routers augmented with special purpose gate arrays sold to the business market. Software-enabled packet filtering functions appear to be available on lower cost edge routers such as Linksys which appear to be sold to the home and small business market. Although there are many versions of open-source software firewall functions for certain models of Linksys routers, the examiner has not been able to check them.

Point of Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Wong whose telephone number is 571-270-1015. The

examiner can normally be reached on Monday-Thursday 8AM - 5PM and every other Friday 8 - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christian Chace can be reached on 571-272-4190. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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